



Regional Strategy for Mitigation and Adaptation to Climate Change in Coastal Tourism of Zadar County

The Consortium:



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TABLE OF CONTENTS

1. INTRODUCTION	7
1.1. Structure and content of the document	7
1.2. Purpose and expected outcomes of the document	8
1.3. Methodological approach	10
2. POLICIES/ LEGISLATION RELATED TO CLIMATE ACTION PLANNING	12
2.1. International policies and legislation	12
2.2. National and regional policies and legislation	13
3. OVERVIEW OF THE CLIMATE RISK ASSESSMENT OF ZADAR COUNTY	14
3.1. Zadar County - general information	14
3.2. Tourism state and impacts	16
3.3. Analysis of the Current State - Mitigation	17
3.4. Analysis of the Current State – Adaptation	20
3.5. Results of Climate Risk Assessment	25
3.6. Challenges and Recommendations for Increasing Climate Resilience in Zadar County	27
4. LONG TERM VISION, ADAPTATION AND MITIGATION OBJECTIVES	30
4.1. Long-Term Vision Statement	30
4.2. Mitigation and Adaptation Objectives	30
4.2.1. Enhance Resilience of Tourist Infrastructure	30
4.2.2. Adapt Tourist Offerings to Changing Climate and Visitor Needs	31
4.2.3. Protect and Restore Natural Areas through Nature-Based Solutions (NBS)	32
4.2.4. Strengthen Institutional Capacity and Stakeholder Coordination	32
4.2.5. Reduce Greenhouse Gas Emissions from Tourism	33
5. ACTION PLAN	35
5.1. Decarbonization Goals	35
5.2. Climate Action 1: Measures for Monitoring the Success of Decarbonisation in Zadar County	26
5.3. Climate Adaptation Goals of Zadar County for Tourism Infrastructure, Tourism Offerings, and Natural Areas	28



5.3. Climate Action 2: Measures to Enhance Climate Resilience of Zadar County	28
6. ENABELING CONTIDIONS and implementation	31
6.1. Indicators	32
6.2. Reporting	33
6.3. Engagement	34
6.4. Review	35
7. CONCLUSIONS	36
7.1. Conclusions for Advancing Climate Action in Zadar County	36
7.2. Conclusions Related to the Implementation of the Interreg NaTour4CC Project	37

List of tables	Page
Table 1. Climate change mitigation measures in Zadar County	16
Table 2. Results of the Climate Risk Assessment (CRA) for the coastal part of Zadar County	24
Table 3. Proposed Measures, Responsible Parties, and Timeline of the Action Plan for the Decarbonisation of Zadar County	34
Table 4. Proposal of measures and activities, responsible parties, and implementation timeline of the Action Plan for adapting tourism in Zadar County to climate change	37
Table 5. Examples of Structural (Infrastructural and Technical) and Non-Structural (Social) Adaptation Measures/Activities and Nature-Based Solutions (NBS)	39



List of figures	Page
Figure 1. Challenges and Applicable Nature-Based Solution (NBS) Concepts	7
Figure 2. Tourism Development Index of Zadar County in 2023. (14
Figure 3 a and b. Greenhouse gas emissions at the NUTS 2 level	15
Figure 4 . Review of enabling conditions and implementation benefits	31

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About project

The Mediterranean region is one of the most vulnerable hotspots in the current biodiversity and climate crises, warming 20% faster than the global average and being the second biodiversity hotspot in the world. The increase of severe climate events is also likely to influence the choice of destinations and time to travel for its over 510 million inhabitants. The effects of climate change will put additional pressure on already strained ecosystems and vulnerable economies and societies, with Tourism being one of the most affected economic sectors.

The recent Transition Pathway for Tourism and the Glasgow Declaration are building a global momentum for Climate Action in Tourism, but policymakers and destinations need support to better develop efficient climate mitigation and adaptation policies using ecosystem-based approaches and improved multi-level governance structures, including robust planning and ensure the long-term engagement of the private sector and citizens. Indeed, ecosystem-based management is considered a good practice to effectively deal with these threats as it considers the different stakeholders and factors affecting ecosystems and the mechanisms involved, in order to find solutions.

NaTour4CChange builds on and capitalizes on successful experiences at the Mediterranean and global level to test solutions for increasing the resilience of coastal destinations in the Mediterranean. The project will aim to set common methods to allow participating regions to assess their tourism-related climate adaptation and mitigation priorities, and take climate action via plans and strategies, supported by cooperative governance.

In coastal destinations, cross-sector teams will deliver specific tourism climate Action Plans, focusing on climate adaptation, where Nature-based Solutions (NbS) will be tested to ensure their feasibility. At the same time, innovative destination marketing and communication approaches will engage private stakeholders, visitors, and residents in climate action.

The project will also ensure cross-fertilization among participating regions and destinations, to achieve common methods and to compare the different tested plans and solutions, leading to lessons, best practices, and policy.



Glossary

The Intergovernmental Panel on Climate Change (IPCC) is a body of the United Nations responsible for assessing science related to climate change. The IPCC was created to provide policymakers with regular scientific assessments of climate change, its implications, and potential future risks, as well as to suggest options for adaptation and mitigation.

Climate Change Adaptation (CCA) refers to predicting the adverse effects of climate change and taking appropriate actions to prevent or reduce the damage they may cause or to exploit opportunities that may arise.

Ecosystem-based Approaches (EbA) focus on managing biodiversity and ecosystems in a holistic way to maintain and enhance the benefits and functions of ecosystem services.

Climate Risk Assessment (CRA) is a structured analysis of climate variables (or hazards) and their impacts in the present and future climate, providing information for decision-making.

Representative Concentration Pathways (RCPs) are climate change scenarios up to 2100 for projecting future greenhouse gas concentrations (not emissions). They describe future concentrations of greenhouse gases and have been officially adopted by the IPCC.

Nature-Based Solutions (NbS) encompass all actions that rely on ecosystems and the services they provide to address various societal challenges, such as climate change, food security, resource management, or disaster risk.

Climate Change Mitigation (CCM) refers to reducing the impacts of climate change by decreasing the emission of greenhouse gases (GHGs) into the atmosphere or enhancing the storage of these gases.

Ecosystem Services (ES) are the benefits that ecosystems provide to society, improving health, the economy, and quality of life for humans.

Shared Socioeconomic Pathways (SSPs) are climate change scenarios based on predicting global socioeconomic changes up to 2100, as defined in the IPCC's Sixth Assessment Report (AR6). They are used to derive greenhouse gas emission scenarios with different climate policies and provide narratives that qualitatively describe alternative socioeconomic developments (including future changes in demographics, human development, economy, lifestyle, policies and institutions, technology, and the environment and natural resources).



1. INTRODUCTION

The European Commission's Transition Pathway for Tourism¹ and the Glasgow Declaration (UN Tourism)² are currently driving climate action in tourism, while national authorities are complementing these efforts by adopting legal frameworks. In Croatia, the Tourism Act (NN 156/23³) has been enacted, aligning with the Climate Change Adaptation Strategy of the Republic of Croatia and the Low-Carbon Development Strategy of the Republic of Croatia (NN 63/21)⁴. This Act represents concrete support for destinations and tourism stakeholders, focusing on the development and implementation of effective climate change adaptation and mitigation monitoring and relevant measures.

The relationship between tourism and climate change has been incorporated into the Sustainable Tourism Development Strategy and the National Action Plan until 2027 (Ministry of Tourism and Sport⁵). The Tourism Act defines all elements necessary for sustainability and enhancing climate resilience of Croatian destinations. Additionally, public bodies dealing with environmental protection⁶ support, encourage and co-finance the implementation of nature-based solutions to decarbonize and adapt destinations.

1.1. Structure and content of the document

This document consists of two main parts. The first part presents the Situation Analysis of Climate Change Mitigation, Adaptation, and Tourism in Zadar County, which serves as the foundation for the Strategy for Climate Change Mitigation and Adaptation in Coastal Tourism of Zadar County, as well as the Decarbonization Action Plan (Climate Action 1).

 The full assessment is available in Deliverable 2.4.1.

The second part of the document focuses on enhancing climate resilience in Zadar County as a coastal Mediterranean tourism destination (Climate Action 2). It includes a Climate Risk Assessment (CRA) and presents the Climate Resilience Action Plan for the County.

¹

https://mint.gov.hr/UserDocsImages/2022_dokumenti/Transition_Pathway_For_Tourism_2_22.pdf

² <https://www.unwto.org/the-glasgow-declaration-on-climate-action-in-tourism>

³ https://narodne-novine.nn.hr/clanci/sluzbeni/2023_12_156_2382.html

⁴ https://narodne-novine.nn.hr/clanci/sluzbeni/full/2021_06_63_1205.html

⁵ Ministry of tourism and sport - MINTS:

https://mint.gov.hr/UserDocsImages/2023_dokumenti/Nacionalni%20plan%20razvoja%20odr%205%BEivog%20turizma%20do%202027.%20godine%20i%20Akcijski%20plan%20do%202025.%20godine.pdf

⁶ The system includes the Ministry of Environmental Protection and Green Transition (MZOZT) as well as public institutions (JU), such as JU Natura Jadra, which manages the protected natural areas of Zadar County.



The development of this document is based on strategic planning processes, aligned with EU and Croatian legislation. The analyses were conducted following methodological guidelines of the Intergovernmental Panel on Climate Change (IPCC), the knowledge base of the Interreg NaTour4CChange project, and other recent and relevant scientific literature.

1.2. Purpose and expected outcomes of the document

The purpose of this document is to provide Mediterranean coastal destinations with a knowledge base and examples of good practices for addressing climate change. Specifically, in the selected pilot area of Zadar County (Dugi Otok, Saharun Beach), a Nature-Based Solution (NBS) will be implemented within a protected natural area to enhance the climate, environmental, economic, and social sustainability of tourism. The County already hosts several good practices that will be further improved through this project. The expected outcome is a synergistic enhancement of tourism sustainability, framed within the broader concept of climate resilience and the goal of achieving climate neutrality at the destination level.

In strengthening climate resilience, the focus is placed on Nature-Based Solutions (NBS). This is a concept promoted by the International Union for Conservation of Nature (IUCN) and other organizations, including the European Commission, emphasizing multidimensional benefits. NBS play a key role in mitigating and adapting to climate change, enhancing the resilience of society and economic sectors, ensuring the long-term protection of human health and property, and improving environmental quality and biodiversity.

The challenges and concepts applicable in this context (and considered in this document) are illustrated in Figure 1.

NBs challenges



NBs Concept



Figure 1. Challenges and Applicable Nature-Based Solution (NBS) Concepts
Source: IUCN



1.3. Methodological approach

In response to growing climate challenges in Croatia's Mediterranean region, a targeted climate risk assessment was conducted for Zadar County. Following IPCC guidelines (GIZ & EURAC, 2017), the assessment evaluated sensitivity, exposure, and vulnerability to key climate hazards such as extreme temperatures, heatwaves, drought, wildfires, floods, sea-level rise, and strong winds. Thematic areas analyzed included:

1. Tourism infrastructure
2. Tourism offer
3. Protected areas

Data were collected through stakeholder questionnaires (14 participants from tourism, planning, academia, and environment), expert judgment, and hydro-meteorological data analysis. Vulnerability was calculated by combining sensitivity and exposure ($V = S \times E$), and climate risks were assessed by combining likelihood and consequence.

A Regional Coordination Unit (RCU) was established, involving:

- Zadar County departments (Tourism, Environment & Planning)
- University of Zadar
- County Tourist Board
- Natura Jadera
- Interreg NaTOUR4Change experts

To support strategic and action planning, the Climate Action Planning Toolkit for Mediterranean Regional Authorities and DMOs (Deliverables 1.5.1 and 1.5.2) was used, including:

1. Scheduler
2. Action Planner (plus 2b: Action Examples)
3. CAP Template

This comprehensive process identified key vulnerabilities and guided the development of targeted climate adaptation measures for the tourism sector in Zadar County.



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2. POLICIES/ LEGISLATION RELATED TO CLIMATE ACTION PLANNING

Climate action in Zadar County is guided by a multilayered legal and policy framework, which includes international agreements, European Union directives, and Croatian national and regional legislation. These frameworks establish the strategic direction, obligations, and tools for assessing climate risks, implementing adaptation measures, and promoting resilience in sensitive areas such as coastal tourism and natural ecosystems.

2.1. International policies and legislation

Zadar County's climate adaptation efforts are anchored in international climate agreements and conventions that Croatia is party to. These instruments shape national and regional approaches to risk assessment, mitigation, and adaptation planning:

United Nations Framework Convention on Climate Change (UNFCCC)⁷ – As a signatory, Croatia is committed to reducing greenhouse gas emissions and enhancing adaptive capacity. The UNFCCC framework underpins all climate action strategies adopted at the national and subnational levels.

Paris Agreement (2015)⁸ – Croatia, through the EU, has committed to climate-neutral development pathways and adaptation strategies aimed at limiting global temperature rise to well below 2°C. This influences the development of Zadar County's climate resilience plans, including tourism-specific adaptation goals.

Sendai Framework for Disaster Risk Reduction (2015–2030)⁹ – This global strategy promotes disaster risk reduction as a key component of climate resilience. Its principles guide Croatia's national Risk Assessments and influence regional planning processes, including Zadar's adaptation to natural hazards such as wildfires and floods.

EU Green Deal (2019)¹⁰ – As part of the European Union, Croatia aligns with the Green Deal objectives of climate neutrality by 2050, climate adaptation, biodiversity protection, and clean energy transition. EU funding mechanisms and guidelines under the Green Deal support local-level implementation in Zadar County.

⁷ <https://unfccc.int/process-and-meetings/what-is-the-united-nations-framework-convention-on-climate-change>

⁸ <https://unfccc.int/process-and-meetings/the-paris-agreement>

⁹ <https://www.undrr.org/publication/sendai-framework-disaster-risk-reduction-2015-2030>

¹⁰ https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en



EU Adaptation Strategy (2021)¹¹ – This strategy emphasizes building climate-resilient societies by improving knowledge and data, increasing risk awareness, and supporting nature-based solutions. It strongly aligns with Zadar County's CRA and its Action Plan for Dugi Otok.

The Glasgow Declaration on Climate Action in Tourism¹², launched at COP26 in November 2021, is a global call for the tourism sector to accelerate climate action. It aims to reduce tourism-related emissions by 50% by 2030 and reach Net Zero by 2050 at the latest. Signatories commit to measuring and reducing their carbon footprint, restoring and protecting ecosystems, collaborating across sectors, and securing financing for climate action. They are required to deliver a climate action plan within 12 months and update it annually. The Declaration is led by UNWTO in partnership with the Travel Foundation, UNEP, VisitScotland, and others, aligning tourism with the goals of the Paris Agreement and promoting a just and resilient transition.

2.2. National and regional policies and legislation

At the national level, Croatia has adopted strategic and legal instruments that define climate action goals, risk management processes, and sectoral adaptation priorities. These frameworks guide Zadar County's approach to climate planning:

Climate Change and Ozone Layer Protection Act (Official Gazette 127/19) – The main legal instrument regulating climate policy in Croatia. It establishes institutional responsibilities and outlines climate change mitigation and adaptation obligations for local and regional authorities.

Croatia's Low-Carbon Development Strategy¹³ (2021–2030) – This strategic document sets the path toward decarbonization and climate resilience, including specific targets for reducing emissions in tourism, infrastructure, and water management sectors, which are critical for Zadar County.

National Adaptation Strategy to Climate Change and Action Plan¹⁴ (NAS/NAP 2020–2040) – This strategy and accompanying action plan identify priority sectors and propose adaptation measures based on climate risk assessments. The NAS is reflected in Zadar County's CRA methodology and sectoral adaptation initiatives.

¹¹ <https://www.zakon.hr/z/2435/zakon-o-klimatskim-promjenama-i-zastiti-ozonskog-sloja>

¹² https://www.oneplanetnetwork.org/sites/default/files/2022-02/GlasgowDeclaration_EN_0.pdf

¹³

https://mingo.gov.hr/UserDocslImages/klimatske_aktivnosti/odrzivi_razvoj/NUS/strat_nisk_razv_2021.docx

¹⁴ <https://mingo.gov.hr/UserDocslImages/KLIMA/Climate%20change%20adaptation%20strategy.pdf>



Risk Assessment of Major Disasters for the Republic of Croatia¹⁵(2022) – A key document identifying climate hazards and informing regional assessments such as Zadar's. It establishes a risk management foundation aligned with the EU Civil Protection Mechanism.

Zadar County Development Plan¹⁶ (2021–2027) – This regional strategic document integrates climate adaptation as a cross-sectoral priority, emphasizing sustainable tourism, biodiversity protection, and water resource management.

Zadar County Risk Assessment of Major Disasters (2022) – Building on national guidelines, this assessment identifies local climate-related hazards (e.g., wildfires, droughts, floods) and directly supports the CRA and adaptation planning processes at the county level.

These policies and legal frameworks collectively guide Zadar County's climate risk assessment and adaptation planning. They ensure consistency with national obligations, promote evidence-based action, and provide a foundation for the integration of climate resilience into key development sectors, particularly tourism and biodiversity conservation.

3. OVERVIEW OF THE CLIMATE RISK ASSESSMENT OF ZADAR COUNTY

In the following chapter, a summarized version of the climate risk assessment for Zadar County is presented, covering the destination's characteristics, mitigation efforts including greenhouse gas emissions and decarbonization actions with related recommendations, as well as adaptation strategies through an analysis of climate resilience, climate variables and hazards, and concluding with key challenges and recommendations to strengthen climate resilience in the region.

3.1. Zadar County - general information

Zadar County, located in the central Adriatic region of Croatia, consists of 34 local self-government units, including 28 municipalities and 6 cities (notably Zadar, Benkovac, Biograd na Moru, Obrovac, Pag, and Nin). Covering 7,276 km², or 8.3% of Croatia's total area, it ranks as the fifth largest county in the country. The county serves as a strategic corridor linking northern and southern Croatia via road (A1 highway), rail, and air transport (Zadar Airport).

Geographic and Natural Features

¹⁵ https://civil-protection-humanitarian-aid.ec.europa.eu/what/civil-protection/national-disaster-management-system/republic-croatia_en

¹⁶ https://www.zadarska-zupanija.hr/images/dokumenti/planski_dokumenti/Plan_razvoja_Zadarske_%C5%BEupanije_2021.pdf



Although centrally positioned on the Croatian Adriatic, most of the county lies within Southern Croatia (Dalmatia), with a smaller segment extending into the Mountainous Croatia region. The Ravni Kotari plateau comprises a large area of arable land, contributing to strong agricultural production. Zadar County boasts a wealth of water resources, including the Zrmanja River, Lake Vrana, and numerous minor watercourses.

The county has Croatia's longest coastline, approximately 1,300 km, including numerous island groups such as the Kornati archipelago, Žut-Sit, Murter, and Cres-Lošinj. About 70% of the territory is mainland, while 30% comprises islands and coastal zones—a layout that underpins its appeal as a tourist destination.

Climate and Environment

The county experiences varying climates—from the Mediterranean climate along the coast, with hot, dry summers and mild winters, to the sub-Mediterranean and snow-forest climates in interior and highland regions, which bring colder winters and cooler nights. Strong winds, particularly the bora (bura), significantly shape local vegetation, architecture, and settlement patterns.

Environmental protection in Zadar County is multi-layered. National and nature parks (Paklenica, Telašćica, Vransko Jezero) are managed by public institutions, while other protected areas and Natura 2000 zones are overseen by Natura Jadra, a regional nature protection authority.

Economic Structure and Transport

Zadar County's economy centers on tourism, agriculture, fishing, manufacturing, and the blue economy, including maritime traffic. Its geopolitical importance is heightened by the A1 highway, part of the future Adriatic-Ionian transport corridor, linking the Baltic region to Central and Southern Italy through Zadar.

Despite lacking county-specific economic data, recent national statistics show the importance of maritime sectors, particularly in Zadar, to the overall economic performance of Croatian Adriatic regions.

Population and Settlement

The county has a population of approximately 160,000, with 90% living in coastal areas. The city of Zadar is the most populous urban center. Infrastructure improvements and coastal development continue to drive demographic and economic trends.

3.2. Tourism state and impacts

Tourism Trends

Tourism is the backbone of the county's economy, with growth accelerating in recent years. The number of overnight stays rose from 12.7 million in 2021 to 15.4 million in 2024, placing Zadar County fourth in Croatia by this metric. Zadar city alone saw a 24% increase in overnight stays in May 2024 compared to the previous year.

According to the Tourism Development Index¹⁷, in 2023, most municipalities in Zadar County fall into Category II (16 municipalities), followed by Category III (11 municipalities), Category IV (2 municipalities), and Category I (1 municipality – Starigrad) and 4 cities (Nin, Biograd, Zadar, and Pag).

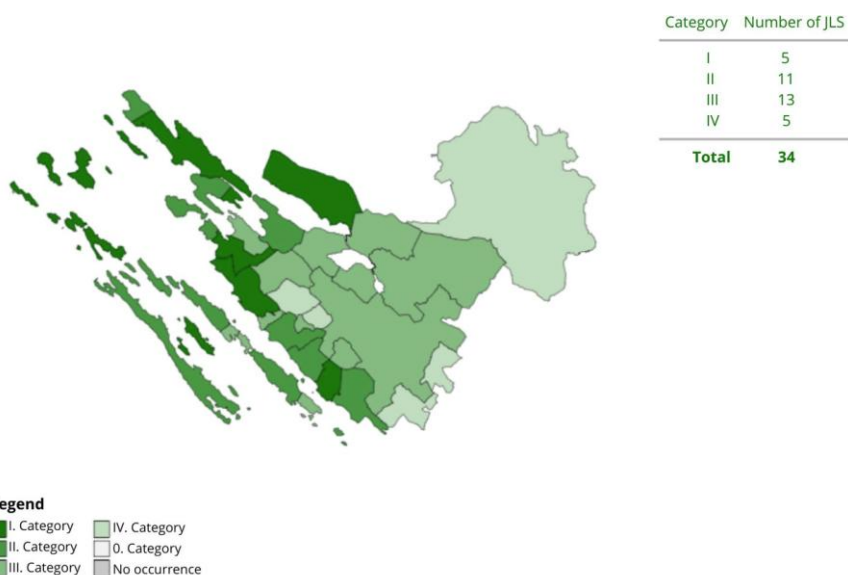


Figure 2. Tourism Development Index of Zadar County in 2023. (Source: IZT, Zagreb)

Commercial accommodation includes over 149,000 beds, mostly in private lodging (over 50%), followed by camps (20%) and hotels/nautical facilities (approx. 20%). The average stay length is 6.1 days, and nautical tourism revenues increased by 15.6% in 2023. Additionally, non-commercial stays accounted for 4.2 million tourists in 2024, or 38.8% of all stays in Croatia—the highest share nationally.

Infrastructure Pressures

Tourism growth presents significant infrastructure challenges. Around 88% of tourists arrive by road, highlighting future needs for EV charging infrastructure.

¹⁷ <https://www.iztg.hr/hr/itr/>



Water consumption peaks at over 120 million liters per day, with nautical tourism adding another 30–40 million liters at full capacity. The wastewater and drainage systems, already strained, are further pressured by intensive seasonal construction and population surges.

In 2022, the average number of daily beach users hit 316,655, translating to just 4.3 m² per person. National Park Paklenica alone saw 129,532 visitors in 2023, demonstrating growing interest in nature-based tourism.

Tourist Behavior and Satisfaction

According to the TOMAS 2023 survey, 95.8% of visitors come for leisure, with 95.1% drawn by the sea, 53.3% by nature, and 23% by events. Most visitors travel by car (79.1%), some in campers (17.3%), and a minority by plane (15.5%). Visitor satisfaction is high, with 95.2% reporting positive experiences.

The survey also reveals visitor profiles: 53% travel with family, 25% with a partner, 21% with friends, and 1% alone. This demographic insight is crucial for tailoring tourism services and future planning.

3.3. Analysis of the Current State - Mitigation

Greenhouse Gas Emissions

In 2021, Croatia's CO₂eq emissions (excluding removals from LULUCF) totaled 17,410.6 ktCO₂eq, showing a decrease from 19,660.0 ktCO₂eq in 2000. According to EUROSTAT, the Accommodation and Food Service Activities sector, including travel agencies and tour operators, emitted 8.4 ktCO₂eq in 2022.

At the regional level, consistent emission data for NUTS 2 and NUTS 3 areas is largely unavailable, aside from isolated studies. However, Zadar County's Development Plan identifies high greenhouse gas emissions as a significant challenge, with transport being the main source—especially during the tourist season when energy use increases, particularly for cooling. The majority of vehicles in the county are diesel-powered (50.1%) or gasoline-powered (47.8%), while other energy sources contribute minimally. Diesel consumption alone (69.5 million kWh) results in annual emissions of 18,568.5 tCO₂eq. Tourist-related transport is also a contributing factor.

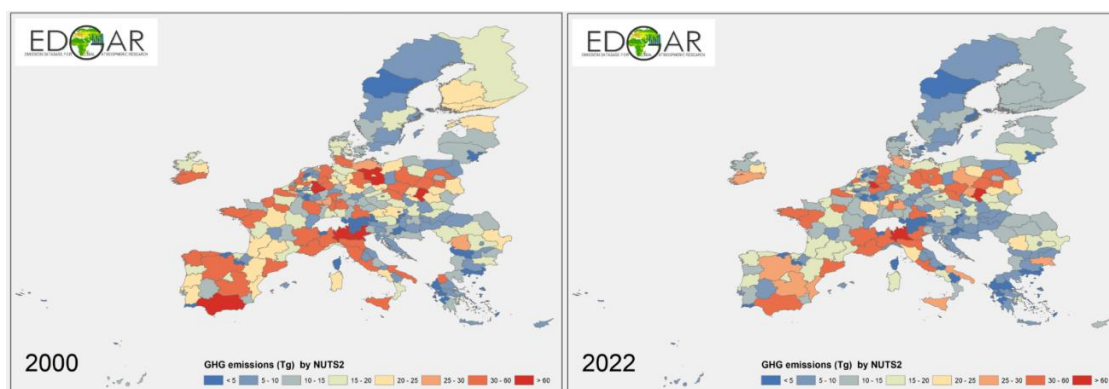


Figure 3 a and b. Greenhouse gas emissions at the NUTS 2 level¹⁸ (source: EC)

For a rough estimate of emissions in Zadar County (NUTS 3), the EDGAR database provides data at the NUTS 2 level, indicating that emissions in the wider region have remained relatively stable over the past 20 years, ranging between 5 and 10 Tg CO₂eq annually.

Climate action: Decarbonisation

Croatia has established a legal and strategic framework for decarbonization, including the National Energy Efficiency Action Plan. These national measures are implemented locally by self-government units (LSGUs), such as Zadar County, through their own climate mitigation and adaptation programs. These include defined actions, responsible authorities, funding sources, and performance indicators.

Zadar County is actively implementing decarbonization measures, outlined in its Energy Efficiency Action Plan (2024–2026). Key actions include promoting energy efficiency among citizens, improving traffic-related emissions through education and infrastructure (e.g., electric vehicle charging stations, procurement of electric vehicles), and enhancing building energy performance through renovation and the installation of photovoltaic systems. Table 1 outlines these sector-specific measures with indicators and timelines.

Table 1. Climate change mitigation measures in Zadar County

Sector	Measure	Measure Description	Performance Indicators and Implementation Period
CROSS-SECTORAL MITIGATION	Promotion of Energy Efficiency for Citizens	Designing and implementing public information and education programs on energy efficiency related to housing, vehicle use, and other segments.	Number of conducted programs, produced informational materials, and web publications; 2023-2026.

¹⁸ https://edgar.jrc.ec.europa.eu/dataset_ghg70_nuts2



MITIGATION	Promotional, Informational, and Educational Measures and Activities for Traffic Improvement and CO ₂ Reduction	Designing and implementing public information and education programs on greenhouse gas emissions and their potential negative consequences.	Number of conducted programs, produced informational materials, and web publications; 2023-2026.
TRANSPORT	Establishment of Alternative Fuel Infrastructure System	Construction of electric charging stations.	Number of installed electric charging stations; 2023-2026.
TRANSPORT	Procurement of Zero-Emission Vehicles Owned by the County	Procurement of electric vehicles.	Number of procured electric vehicles; 2023-2026.
ENERGY EFFICIENCY	Improvement of Systematic Energy Monitoring and Management in County Administration and Institutions/Companies Buildings	Use of innovative information and communication technologies (ICT) to reduce GHG emissions.	Developed application; 2023-2026.
CONSTRUCTION	Integrated Energy Renovation of County Administration and County Institutions/Companies Buildings	After establishing an energy monitoring and management system in County Administration and County Institutions/Companies buildings, an analysis will be conducted	Number of renovated buildings; 2023-2026.
CONSTRUCTION	Installation of Photovoltaic Systems on the Roofs of County Institutions/Companies Buildings	Installation of photovoltaic systems on County buildings that meet the criteria for using photovoltaic systems.	Number of buildings with installed photovoltaic systems; 2023-2026.

One notable example of good practice was the 2019 procurement of 25 low-emission EURO VI standard buses for public transport. Other initiatives include energy renovation of homes and schools, public awareness campaigns, and events like "Turn on and Save."

At the city level, the City of Zadar has developed its own Energy Efficiency Action Plan (SECAP), aligned with national strategies and international commitments such as the Covenant of Mayors. The plan includes actions like improving public lighting, installing solar systems in schools, enhancing transport efficiency, and promoting cycling. The city uses the ISGE system to monitor energy and water consumption in public buildings.

Zadar County's extensive forested area—over 222,000 ha, most of which is state-owned—plays an important role as a carbon sink. These areas are managed and protected by public institutions, contributing both to climate mitigation and biodiversity conservation. The City of Zadar has also adopted a Strategy for



Nature-Based Solutions, promoting green infrastructure that supports emissions reduction and adaptation.

Recommendations for Decarbonization in Zadar County

To strengthen decarbonization efforts, it is recommended that Zadar County update its energy balance (last completed in 2012) to better understand current consumption trends. This would enhance energy planning across all sectors, particularly tourism.

Further collaboration is advised between the county, relevant ministries, the Environmental Protection and Energy Efficiency Fund (EPEEF), and local LSGUs. Measures should focus on integrating renewable energy, improving efficiency in households, transport, and public services, and aligning with EU climate goals: a 55% emission reduction by 2030 and climate neutrality by 2050. Nature-based solutions, forest conservation, and sustainable land use are also essential in boosting carbon absorption. To support this, a system for tracking energy use, project impacts, and carbon sink performance should be established.

Zadar County should act as a key coordinator, bringing together public institutions, the private sector, tourism stakeholders, civil society, and researchers. While awareness efforts have been effective, it is important to expand outreach to include tourism industry stakeholders, infrastructure developers, and even visitors, to support a comprehensive and inclusive decarbonization strategy.

3.4. Analysis of the Current State – Adaptation

Overview of Zadar County's Climate Vulnerability

Zadar County is a geographically and ecologically diverse region that encompasses both mainland and numerous islands, including sensitive terrestrial and marine ecosystems. The county is particularly vulnerable to climate change due to its ecological makeup, including extensive karst terrain, which is known for limited soil depth and poor water retention, as well as its exposure to the Adriatic Sea. These features, coupled with a high dependency on tourism and related economic activities, underscore the importance of a strategic and integrated approach to adaptation.

Tourism Dependency and Ecosystem Sensitivity

Tourism in Zadar County relies heavily on its natural assets, including national parks, coastal landscapes, and biodiverse marine environments. However, these assets are increasingly exposed to a range of climate hazards. The 2022 Risk Assessment of Major Disasters for Zadar County, developed in alignment with the national framework, identified key climate threats: extreme temperatures, droughts, wildfires, floods, storms, and strong winds. These hazards directly impact both residents and tourists and pose severe risks to infrastructure, public health, agriculture, and biodiversity.



In response, Zadar County has initiated and implemented a variety of climate change adaptation measures across sectors. These initiatives are designed to build long-term resilience and protect the county's socio-economic and environmental foundations.

Table 2. Existing climate change adaptation measures in Zadar County.



Sector	Measure Name	Implementation
CROSS-SECTORAL ADAPTATION	Promotion, informative, and educational measures to raise awareness about climate change events in the local community	2023.-2026.
CROSS-SECTORAL ADAPTATION	Preparation, promotion, and implementation of workshops for stakeholders in education	2023.-2026.
SPATIAL PLANNING	Analysis and preparation for the implementation of the coastal zone protection plan from the effects of the sea and water	2023.-2026.
URBAN DEVELOPMENT	Preparation for improving the concept of green infrastructure	2023.-2026.
URBAN DEVELOPMENT	Implementation of the green infrastructure concept	2023.-2026.
URBAN DEVELOPMENT	Landscape/horticultural arrangement of institutions founded by Zadar County	2023.-2026.
WATER RESOURCES	Investigation of groundwater quality for multi-purpose use depending on composition	2023.-2026.
HEALTH	Strengthening resilience to the pressures of climate change	2023.-2026.
HEALTH	Strengthening the monitoring system of allergenic species	2023.-2026.
HEALTH	Upgrading the system for monitoring climate indicators	2023.-2026.
BIODIVERSITY	Raising awareness about ecosystems, habitats, wild species, protected areas, and ecological network areas, and the importance of preserving ecosystem services and their impact on all aspects of life and the economy	2023.-2026.
BIODIVERSITY	Incorporating climate change adaptation measures into key management documents for protected areas and ecological network areas, including implementation indicators	2023.-2026.
BIODIVERSITY	Defining measures to reduce the spread and limit the populations of invasive alien species	2023.-2026.



BIODIVERSITY	Strengthening the capacity of relevant authorities for nature conservation	2023.-2026.
AGRICULTURE	Analysis of possibilities for building innovative irrigation systems	2023.-2026.
AGRICULTURE	Education of farmers for the construction of irrigation reservoirs	2023.-2026.
AGRICULTURE	Co-financing of irrigation equipment for family farms	2023.-2026.
AGRICULTURE	Education of farmers on growing species and varieties of agricultural crops and breeds of domestic animals that are more resistant to climate change	2023.-2026.
AGRICULTURE	Support for farmer education	2023.-2026.

Cross-Sectoral Adaptation and Community Engagement

Cross-sectoral adaptation has focused heavily on raising public awareness and education. Between 2023 and 2026, a series of promotional campaigns and educational workshops are being rolled out to inform local communities, educators, and other stakeholders about climate risks and appropriate adaptive behaviors. These efforts are essential for fostering community engagement and shared responsibility in adapting to new climate realities.

Spatial and Urban Planning Initiatives

Spatial and urban planning measures have also been prioritized. Coastal zones are particularly threatened by sea-level rise and storm surges, making it vital to conduct in-depth analyses and develop coastal protection plans. Concurrently, efforts are underway to integrate green infrastructure concepts into urban development. The implementation of these green solutions—such as urban greening, sustainable landscaping, and ecosystem-based adaptation—aims to reduce urban heat island effects, enhance stormwater management, and support biodiversity within built environments.

Water Resource Management for Resilience

Water resource management is another critical area, especially given the county's karst topography and the increasing incidence of drought. From 2023 to 2026, investigations into groundwater quality and multipurpose use are being conducted to enhance water security. Ensuring the sustainability of



groundwater resources is crucial for both domestic consumption and agricultural use.

Health Sector Adaptation Measures

The health sector is also actively preparing for climate-related challenges. Key actions include strengthening resilience to heatwaves and vector-borne diseases, enhancing the monitoring of allergenic plant species, and upgrading systems that track climate indicators. These adaptations help safeguard public health, especially during the peak tourist season when the population in Zadar County temporarily surges.

Biodiversity Protection and Ecosystem Management

In terms of biodiversity, a wide range of actions are being implemented. Raising awareness about ecosystems, their services, and the ecological networks that sustain them is a cornerstone of this effort. Management plans for protected areas are being revised to integrate climate change considerations and performance indicators. Furthermore, specific measures to manage invasive alien species and strengthen institutional capacities for nature conservation are in progress, ensuring that the region's rich biodiversity is better protected against the pressures of a changing climate.

Agricultural Sector Adaptation

Agriculture, a significant economic sector in rural parts of the county, is also adapting. Farmers are being educated on resilient crops and livestock varieties, and support is being provided for innovative irrigation systems and equipment. These measures address both the immediate and long-term water demands associated with increasing droughts, thereby enhancing the resilience of agricultural production systems.

Strategic Framework and Climate Risk Assessment Integration

The adaptation framework in Zadar County is both broad and forward-looking, covering immediate needs and setting the foundation for long-term resilience. It aligns with broader EU and national strategies, ensuring cohesion in climate governance. Crucially, these measures are part of a living document—subject to ongoing monitoring, evaluation, and refinement—as more climate data becomes available and as community needs evolve.

In parallel with local initiatives, the County has also contributed to the Climate Risk Assessment (CRA), which incorporates various climate projections and scenario analyses using RCP 4.5 and RCP 8.5, as well as socio-economic pathways (SSPs). The CRA serves as the analytical backbone of the County's



adaptation strategy and will be detailed further in subsequent chapters. This comprehensive risk analysis identifies vulnerabilities across sectors and geographical zones, helping to prioritize interventions and allocate resources effectively.

Building Resilience for the Future

The measures detailed in Table 2 represent a coordinated, multi-sectoral approach to climate adaptation, encompassing education, urban and rural development, health, biodiversity, and agriculture. The cross-cutting nature of these actions reflects an understanding that climate risks are interconnected and require integrated responses.

Zadar County's proactive stance on adaptation is commendable, particularly given the scale and complexity of the challenges posed by climate change. With a significant portion of the county's identity and economy tied to its natural landscapes and tourism appeal, these efforts are not only environmentally necessary but economically prudent. As climate pressures mount, continued investment in adaptation will be essential to safeguard the region's ecosystems, communities, and livelihoods.

In summary, Zadar County has demonstrated significant progress in assessing and addressing climate change impacts. Its multi-pronged adaptation strategy is grounded in scientific risk assessment and supported by a comprehensive action plan. With ongoing commitment, collaboration, and community engagement, the county is well-positioned to build resilience in the face of future climate uncertainties.

3.5. Results of Climate Risk Assessment

To build upon the 2022 Risk Assessment for Major Disasters in Zadar County and support climate adaptation planning, a Climate Risk Assessment (CRA) was conducted. This CRA integrates findings from previous analyses (Chapter 2.3.2.1), data collected through stakeholder and citizen questionnaires, and the results are summarized in Table 3.

The CRA follows the Intergovernmental Panel on Climate Change (IPCC) methodology and incorporates data from the Croatian Meteorological and Hydrological Service (CMHS), scientific literature, field surveys, and insights from the Interreg NaTour4CChange project. It was prepared by the Institute for Tourism as a key deliverable of the project.

The CRA evaluates how climate hazards will impact three thematic areas in Zadar's coastal zone: **Tourist Infrastructure**, **Tourist Offer**, and **Natural Areas**. It serves as a foundation for identifying, selecting, and implementing effective adaptation measures, particularly in tourism and nature-based resilience strategies. An action plan based on CRA results is under development for the



pilot site of Dugi Otok, while the county-level CRA offers a broader, regional perspective.

Key Findings of the CRA

The assessment analyzed 18 climate hazards, of which the most significant are shown in Table 2. These include **extreme air temperatures, heatwaves, drought, wildfires, floods, sea floods**, and **strong winds/storm gusts**. Risks were assessed for both current and future climate scenarios using a 0–5 scale, where 5 represents high risk.

Table 2. Results of the Climate Risk Assessment (CRA) for the coastal part of Zadar County

CLIMATE VARIABLES/HAZARDS	THEMATIC AREAS	RISK LEVEL	
		Current climate	Future climate
Extreme Air Temperatures	Tourist Infrastructure	2	3
	Tourist Offer	1	3
	Natural Areas	2	4
Heatwaves (Land)	Tourist Infrastructure	3	3
	Tourist Offer	2	3
	Natural Areas	2	4
Drought (Reduced Water Availability)	Tourist Infrastructure	2	3
	Tourist Offer	1	2
	Natural Areas	2	4
Wildfires	Tourist Infrastructure	3	4
	Tourist Offer	2	3
	Natural Areas	4	4
Floods	Tourist Infrastructure	2	3
	Tourist Offer	1	2
	Natural Areas	1	3
Sea floods	Tourist Infrastructure	3	4
	Tourist Offer	3	3
	Natural Areas	1	3
Strong Winds and Storm Gusts	Tourist Infrastructure	2	4
	Tourist Offer	1	3
	Natural Areas	2	3

Legend:

0	No risk / Negligible
1 – 2	Low risk level
3 – 4	Medium risk level

5 High risk level

Notably, **natural areas** emerged as the most vulnerable thematic area, showing medium risk levels (4) for four major hazards: wildfires, droughts, extreme air temperatures, and heatwaves. Tourist infrastructure and services also face increasing threats, particularly from wildfires, strong winds, and rising sea levels. While no hazards reached the highest risk level (5), future climate scenarios show a clear trend toward **escalating risk**—especially for **wildfires, sea floods, and heatwaves**.

This rising risk is largely driven by **atmospheric warming**, with increasing average and extreme temperatures intensifying heat-related events and exacerbating drought and fire conditions. For example, wildfire risk for tourist infrastructure increases from a current level of 3 to 4 in future projections. Similarly, sea floods pose growing challenges to infrastructure and the tourist offer, especially in low-lying coastal zones. The CRA underscores the importance of **integrated climate adaptation strategies** that address environmental, social, and economic dimensions. It highlights the interdependence of thematic areas and the need for cross-sectoral coordination. While climate risks are currently at manageable levels, projected changes necessitate urgent and proactive adaptation to maintain the long-term viability of Zadar County's tourism and ecosystems.

This assessment will inform upcoming action plans and guide climate-resilient development, particularly through nature-based solutions tailored to local vulnerabilities and climate trends.

3.6. Challenges and Recommendations for Increasing Climate Resilience in Zadar County

The main feature of all climate projections is the uncertainty of the scale of changes.

The climate results from a complex interplay of natural and anthropogenic factors, which makes it difficult to predict with precision how it will change, both globally and locally. Additionally, the climate system itself has intrinsic variability. Seemingly small changes can lead to strong and sudden impacts, including cascading reactions.

In the conducted Climate Risk Assessment (CRA), the future climate was simulated according to the so-called medium (moderate) scenarios/paths:

- a) Scenarios of greenhouse gas concentrations **RCP4.5 and RCP8.5**, used in the CRA process for analyzing exposure in both the current and future climate.



- b) The greenhouse gas emissions scenario **SSP2**, used for providing a qualitative description of alternative socio-economic development.

Through the CRA (Chapter 2.3.2.), climate risks with significant potential to threaten tourism and other economic activities in Zadar County were ranked. According to the results presented in Table 3, these include:

- a) **For the current climate:** wildfires, with natural areas being the most vulnerable, and sea flooding, which poses the greatest threat to tourism infrastructure.
- b) **For the future climate:** extreme air temperatures, heatwaves, drought with reduced water availability, wildfires, floods, sea flooding, strong winds and storm surges, and the effects of solar radiation on property, people, and nature.

Based on the results, it can be concluded that adaptation measures for tourism in the coastal area of Zadar County have become a necessity for all three thematic areas (TAs). At present, only the trend of changes is reliably known, making it crucial to adequately prepare and manage climate risks in the destination. Therefore, to increase climate resilience against these risks and for the TAs, it is generally **recommended that potential adaptation solutions be phased and feasible for all climate change scenarios.**

Individually, for each TA, this implies that:

Tourist infrastructure should be designed, planned, implemented, and maintained in a way that makes it resilient to identify climate risks.

Tourist offerings should be adaptive, focused on sustainable forms of tourism that provide visitors with safety, comfort, and preserved attractions throughout the entire year.

Natural areas, which are particularly under potential pressure from climate risks compared to other considered TAs, should be a special focus not only for nature protection and conservation stakeholders but also for those who use ecosystem services – from tourism companies to visitors, including the local population.

The implementation of **Nature-Based Solutions** (NBS) has proven to be crucial, which implies the need to strengthen both the public and private sectors in terms of increasing knowledge and skills, financial resources, and coordination among decision-makers.

In addition to the already implemented structural and non-structural adaptation measures, a strong recommendation is to implement NBS in all considered TPs (and beyond), which some parts of the coastal destination are already doing.



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4. LONG TERM VISION, ADAPTATION AND MITIGATION OBJECTIVES

As previously stated climate change poses significant challenges to coastal tourism destinations worldwide, including Zadar County. Increasing temperatures, more frequent and intense heatwaves, wildfires, droughts, floods, sea-level rise, and stronger storms threaten the natural environment, infrastructure, and visitor experience that underpin the local tourism economy. The recent Climate Risk Assessment (CRA) highlights medium to high risks in key areas, particularly natural ecosystems, tourist infrastructure, and tourism services, with risks projected to intensify under future climate scenarios.

4.1. Long-Term Vision Statement

In this context, it is crucial to establish a comprehensive long-term vision that guides sustainable, climate-resilient development of tourism in Zadar County. This vision must integrate mitigation of climate impacts and proactive adaptation to preserve the destination's unique natural and cultural assets while maintaining economic viability and social well-being.

The following vision and associated objectives aim to create a balanced and forward-looking framework that supports the transition toward resilient coastal tourism in a changing climate.

"By 2050, Zadar County will be a resilient, sustainable, and adaptive coastal tourism destination that harmoniously balances the protection of its unique natural areas, the robustness of tourist infrastructure, and the diversity of tourist offerings, ensuring year-round safety, comfort, and enjoyment for visitors and residents alike. The destination will be a leader in climate-smart tourism, leveraging nature-based solutions and innovative technologies to minimize climate risks, preserve biodiversity, and sustain local economies in the face of evolving climate challenges."

4.2. Mitigation and Adaptation Objectives

4.2.1. Enhance Resilience of Tourist Infrastructure

Explanation:

Tourist infrastructure—such as hotels, resorts, marinas, transport facilities, and public spaces—is foundational to the visitor experience and local economy. However, this infrastructure is increasingly vulnerable to climate hazards including wildfires, sea floods, extreme temperatures,



and storm surges. Damage or disruption can lead to economic losses and deter visitors.

Objective:

Ensure that all existing and new tourist infrastructure is designed, constructed, and maintained to withstand current and future climate risks, thereby minimizing damage and ensuring continuous operation under adverse conditions.

Key Actions:

- Incorporate climate-resilient materials and engineering standards that address heat, fire, flooding, and wind impacts.
- Elevate and flood-proof infrastructure in low-lying and flood-prone coastal zones to reduce vulnerability to sea floods and storm surges.
- Establish and enhance early warning and emergency response systems for extreme weather events to protect visitors and infrastructure.
- Implement vegetation management and firebreaks around infrastructure to reduce wildfire risks.

4.2.2. Adapt Tourist Offerings to Changing Climate and Visitor Needs

Explanation:

Tourist experiences and services must evolve to maintain appeal, safety, and sustainability in the face of climate-driven changes. Increasing heatwaves, water scarcity, and environmental degradation can limit visitor comfort and reduce the attractiveness of seasonal tourism activities.

Objective:

Develop and promote diverse, adaptive, and sustainable tourism products and services that respond to climatic variability and prioritize visitor safety and environmental conservation, supporting year-round tourism.

Key Actions:

- Diversify tourism offerings to include low-impact activities that are less sensitive to extreme heat or water shortages, such as cultural tourism, nature walks, and wellness tourism.
- Promote off-season tourism to reduce pressure on resources and spread economic benefits more evenly.



- Inform and educate tourists on climate risks, encouraging responsible behavior and preparedness.
- Support local tourism operators in adopting sustainable practices and obtaining eco-certifications.

4.3.3. Protect and Restore Natural Areas through Nature-Based Solutions (NBS)

Explanation:

Natural areas—including forests, wetlands, coastal dunes, and marine ecosystems—are vital for biodiversity, ecosystem services, and tourism attractiveness. These areas also act as natural buffers against climate impacts such as floods, fires, and erosion. Protecting and restoring these ecosystems enhances their resilience and the overall sustainability of the destination.

Objective:

Conserve and restore natural habitats to bolster their capacity to absorb climate shocks, support biodiversity, and provide recreational and aesthetic benefits critical to tourism.

Key Actions:

- Implement reforestation and wetland restoration projects to reduce wildfire incidence and improve water retention.
- Restore and stabilize coastal dunes and vegetation to protect against sea flooding and erosion.
- Establish conservation zones to limit development and protect sensitive ecosystems.
- Foster collaboration among government, private sector, NGOs, and communities to manage natural areas effectively.

4.3.4. Strengthen Institutional Capacity and Stakeholder Coordination

Explanation:

Effective climate adaptation requires integrated governance involving multiple sectors such as tourism, environment, urban planning, and emergency services. Strong institutional capacity and coordinated efforts ensure that adaptation strategies are coherent, adequately resourced, and responsive to evolving risks.

Objective:

Build cross-sectoral governance frameworks and enhance skills,



knowledge, and resources among stakeholders to enable coordinated, effective climate adaptation planning and implementation.

Key Actions:

- Develop integrated climate adaptation strategies and action plans that align with tourism development goals.
- Provide regular training and capacity-building programs for local authorities, tourism businesses, and community organizations on climate risk management.
- Establish mechanisms for stakeholder collaboration, information exchange, and joint decision-making.
- Secure sustainable funding sources for ongoing adaptation initiatives and research.

4.3.5. Reduce Greenhouse Gas Emissions from Tourism

Explanation:

Mitigating climate change by reducing greenhouse gas emissions is essential to limit long-term risks. The tourism sector, while vulnerable to climate impacts, also contributes to emissions through energy use, transportation, and waste.

Objective:

Promote sustainable tourism practices that minimize carbon emissions and environmental footprint while enhancing the destination's appeal as a green and responsible tourism hub.

Key Actions:

- Encourage hotels, resorts, and tourism facilities to improve energy efficiency and switch to renewable energy sources.
- Promote sustainable mobility options such as walking, cycling, public transport, and electric vehicles for tourists and staff.
- Implement waste reduction, recycling, and water conservation measures across tourism operations.
- Raise awareness among visitors about sustainable behaviors and carbon footprint reduction.

This vision and its objectives establish a clear pathway for Zadar County to become a climate-resilient coastal tourism destination. By addressing vulnerabilities in infrastructure, tourism products, and natural ecosystems—and strengthening institutional frameworks while



reducing emissions—the destination can protect its environmental and economic future amid the uncertainties of climate change.

These strategic directions emphasize **integration, sustainability, and proactive adaptation**, positioning Zadar County as a model for climate-smart tourism development in the Adriatic region.



5. ACTION PLAN

5.1. Decarbonization Goals

The Interreg EURO-MED NaTour4CC project provides a knowledge base to support Mediterranean coastal destinations in achieving existing decarbonization goals. It also offers a proposal for a robust Decarbonization Action Plan for Zadar County, based on the Situation Analysis and the latest developments in climate change mitigation (see Table 4).

The climate change mitigation goals of Zadar County are aligned with national climate targets, the UN Tourism Glasgow Declaration, with the objectives of the European Commission and with long term vision and adaptation and mitigation objectives from this Document (chapter 4):

1. Ensure the primary measurement and public availability of tourism-related emissions, in accordance with IPCC guidelines.
2. Accelerate the decarbonization of the tourism industry within the destination—including infrastructure, accommodation, tourism activities, and hospitality.
3. Continue supporting the decarbonization of all related sectors contributing to emissions—transport, energy, agriculture, construction, waste management, and wastewater.
4. Set at least five-year targets aligned with scientific findings and climate scenarios.

5.2. Climate Action 1: Measures for Monitoring the Success of Decarbonisation in Zadar County

Table 3. Proposed Measures, Responsible Parties, and Timeline of the Action Plan for the Decarbonisation of Zadar County

NO.	MEASURE	RATIONALE AND DESCRIPTION OF ACTIVITIES	RESPONSIBLE PARTIES / FUNDING SOURCES	TIMELINE
1	Development of a new energy balance	An analysis of the energy balance is necessary for sustainable management.	Zadar County	2027
2	Establishing a data flow system for accelerated decarbonisation management of the destination	Accelerated decarbonisation of all economic sectors in the destination, including tourism, requires data-based decision-making and communication of progress.	Zadar County	2026
3	Continued cooperation with tourism, construction, transport, economy, and other sectors in promoting decarbonization	Energy efficiency programs aligned with national measures and Environmental Protection and Energy Efficiency Fund (FZOEU) calls are being implemented. There is potential for progress in transport energy efficiency and establishing environmentally sustainable local supply chains. In tourism infrastructure and offer, improving the LULUCF sector is key.	Zadar County, Local Self-Governments (LSGs), relevant ministries, FZOEU, EU funds	Ongoing
4	Accelerated decarbonisation of highly developed (and thus energy-intensive) tourist areas, with stronger application of Nature-Based Solutions (NBS)	To achieve energy and cost savings, and considering tourism can account for over 10% of total energy consumption in the destination, institutionally supported acceleration of decarbonisation is essential, along with greater promotion and application of NBS.	Zadar County, LSGs, relevant ministries, EU funds	Ongoing
5	Promotion and support for reducing emissions from transport	Establishment of sustainable transport systems (alternative-powered vehicles/vessels, bicycles) and infrastructure (charging stations, trails/routes, walkways, etc.).		
6	Support for preservation of the LULUCF sector and environmental and spatial protection	Healthy forests, environmental protection, and sustainable land use are vital for tourism sustainability in the destination.		
7	Implementation of NBS in tourism infrastructure and destination offer	Implementing NBS is key for urban areas in the region, such as green infrastructure to reduce traffic emissions, etc.		

<div>8</div> <div>Changes in current energy consumption patterns – collaboration of governance structures with economic actors, local residents, and visitors</div>	<div>Public disclosure of energy savings data; education of tourism businesses; raising awareness among tourism stakeholders; introduction of energy management systems/eco-labels (ISO 50001, EU Ecolabel); informing about crisis situations and energy-saving needs through alternative solutions (e.g. reducing cooling energy via energy efficiency measures and green/blue infrastructure in tourism).</div>
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5.3. Climate Adaptation Goals of Zadar County for Tourism Infrastructure, Tourism Offerings, and Natural Areas

The climate adaptation goals of Zadar County for tourism infrastructure, tourist services, and natural areas depend on the level of vulnerability, that is, the degree of climate risk identified in the Climate Risk Assessment (CRA). A key element of adaptation is the use of Nature-Based Solutions (NBS), which often contribute simultaneously to both climate mitigation and adaptation.

The climate adaptation goals of Zadar County are aligned with global, EU, and national objectives aimed at achieving adequate climate resilience:

1. Maintain the continuity of ecosystem restoration and protection.
2. Ensure that the tourism sector supports affected and vulnerable communities in building resilience, adapting, and responding to disasters.
3. Establish cooperation and education among all stakeholders at the destination level, and strengthen data-driven planning and management across all levels.
4. Secure sufficient financial resources and human capacities to achieve the above-mentioned goals.

5.3. Climate Action 2: Measures to Enhance Climate Resilience of Zadar County

Table 4. Proposal of measures and activities, responsible parties, and implementation timeline of the Action Plan for adapting tourism in Zadar County to climate change

NO.	MEASURE	EXPLANATION AND DESCRIPTION OF ACTIVITIES	RESPONSIBLE PARTIES / FUNDING SOURCES	TIMELINE
1	Encourage tourism and supporting infrastructure (e.g., communal) that is long-term resilient (at least 25 years) to heat waves, drought, water shortages, fires, floods, sea flooding, and solar radiation	Infrastructure should be designed, planned, constructed, and maintained to withstand climate changes and ensure the stability of the tourism offer, human health, and community well-being. It is necessary to follow guidelines (e.g., Technical Guidelines for Infrastructure Adaptation to Climate Change until 2027 (EU) and other relevant literature). Examples of structural measures/activities are given in Table 6.	Zadar County, local self-government units, Ministry of Environment and Energy, Ministry of Tourism and Sports / Fund for Environmental Protection and Energy Efficiency, EU funds	Continuous
2	Ensure adaptability of year-round tourism offerings focused on sustainable tourism forms and Nature-Based Solutions (NBS)	Besides the usual destination offer (sun and sea), visitors are provided with safety, comfort, and preserved attractions supported by structural and non-structural measures and NBS. The application of sustainable tourism forms (active, eco-tourism, etc.) and all types of measures (Table 6) depend on destination characteristics and expert decisions.	Zadar County, local self-government units, EU funds	Continuous
3	Strengthen management of natural and urban destination areas to reduce the burden of tourism and climate change. Priority is given to protected natural areas.	Natural and urban areas are increasingly visited. Whether protected or not, they face significant pressure from climate risks and tourism. Management is strengthened through the implementation of NBS (Table 6), stakeholder education in tourism, raising public awareness about tourism's use of ecosystem services, and the need to "return" what is used through targeted investments. Stakeholders include all those who use ecosystems or apply an ecosystem-based approach to adapting natural areas – from destination management bodies and public	Zadar County, local self-government units, Ministry of Environment and Energy, Ministry of Tourism and Sports / Fund for Environmental Protection and Energy Efficiency, EU funds	Continuous

nature protection organizations to tourism companies,
visitors, local residents, and NGOs.

Table 5. Examples of Structural (Infrastructural and Technical) and Non-Structural (Social) Adaptation Measures/Activities and Nature-Based Solutions (NBS)

MEASURES	CLIMATE HAZARDS WITH HIGH RISK LEVEL IDENTIFIED BY CAP IN THE DESTINATION						ADVANTAGES AND LIMITATIONS OF MEASURES
	Heat Waves	Drought and Water Shortage	Wildfires	Floods	Sea Flooding	Strong Winds and Storms	
Structural Measures	Energy efficiency measures and renewable energy sources (RES) for electricity supply (cooling during summer tourist season);	Construction of permeable surfaces and underground/aboveground water reservoirs;	Increasing resilience of surrounding land to fires;	Hydrological and construction measures to reduce flood risk (maintenance of dams, drainage canals, etc.);	Construction of bioretention areas, green walls, rain gardens, etc.	Promote construction and renovation (reconstruction) of infrastructure and buildings with emphasis on risk prevention.	Planned long-term, easy to implement with decisions and financial support.
	Use of materials resistant to prolonged high temperatures;	Solutions for reducing water consumption in tourist and hospitality facilities (smart irrigation systems, low-flow showers and taps/limited shower time, low-flow toilets, etc.);	Increasing fire resistance of infrastructure using fire-resistant materials;	Conversion of impermeable surfaces into permeable ones;	Walls, embankments, breakwaters, artificial reefs, barriers;	Ensure restoration of protected natural areas (and, if possible, other natural areas) in case of windstorms.	
	Blue-green solutions that increase comfort (e.g., water misters, fountains, green parks, gazebos).	Alternative systems for water purification and recycling	Establishment of technologically advanced early warning systems at the level of tourist facilities and offerings.	Imitation of natural biological regimes;	Raising building heights, floating houses, etc.; Coastal construction — shifting the shoreline seaward.		

Non-structural measures	Planning of systematic and institutionalized procedures;						Environmentally friendly, flexible, and cost-effective. Results are excellent if implemented synergistically.
	Inclusion of vulnerable communities in planning and implementation;						
	Conducting training on preparedness measures for tourism actors (e.g., preparing emergency supplies, identifying safe routes, locating nearest shelters, covering windows and doors);						
	Organizing awareness-raising and education programs on procedures in case of risk occurrence;						
	Establishment of a reporting and information platform.						
Nature based solutions	Structural measures: · green roofs, green walls, · urban gardens, shared courtyards, etc. Measures in public spaces: · urban parks · green corridors · peri-urban parks/forests Measures for transport infrastructure: · greening of transport infrastructure						There is a distinction between structural and non-structural measures, which compared to structural measures can be more easily applied, also have long durability, and are often more cost-effective. However, there is still limited understanding of how to evaluate ecosystem services in monetary terms.
	Rainwater harvesting, infiltration wells, rain gardens, retention basins and lakes, etc. Restoration of natural groundwater infiltration	Sustainable forest management · Maintenance of forests and selection of species less prone to fires; · Construction and maintenance of firebreak roads.	Measures to mitigate the impact of surface water flooding: · Renaturalization of river materials; · Renaturalization of riverbeds; · Measures to mitigate the impact of surface water flooding (rain gardens, retention basins, green filter strips, trees, channels, and ditches).	Preservation or restoration of wetlands or reefs for coastal protection – nature-based solutions – green infrastructure · Construction and reinforcement of sand dunes; · Nourishment of coasts/beaches with naturally sustainable/native materials.	Coastal vegetation and sand dunes can provide protection from storm surges, strong winds, and cyclones. For this specific climate hazard, in an urban context, no natural solution has been identified.		

6. ENABELING CONTIDIONS AND IMPLEMENTATION

To ensure the success of Zadar County’s Decarbonization and Climate Adaptation Action Plan, it is essential to establish strong enabling conditions. These conditions help to translate policy goals into operational change, foster stakeholder ownership, and ensure long-term sustainability and resilience. The four pillars of enabling implementation—Indicators, Reporting, Engagement, and Review—form the backbone of a responsive, transparent, and evidence-based climate governance system.

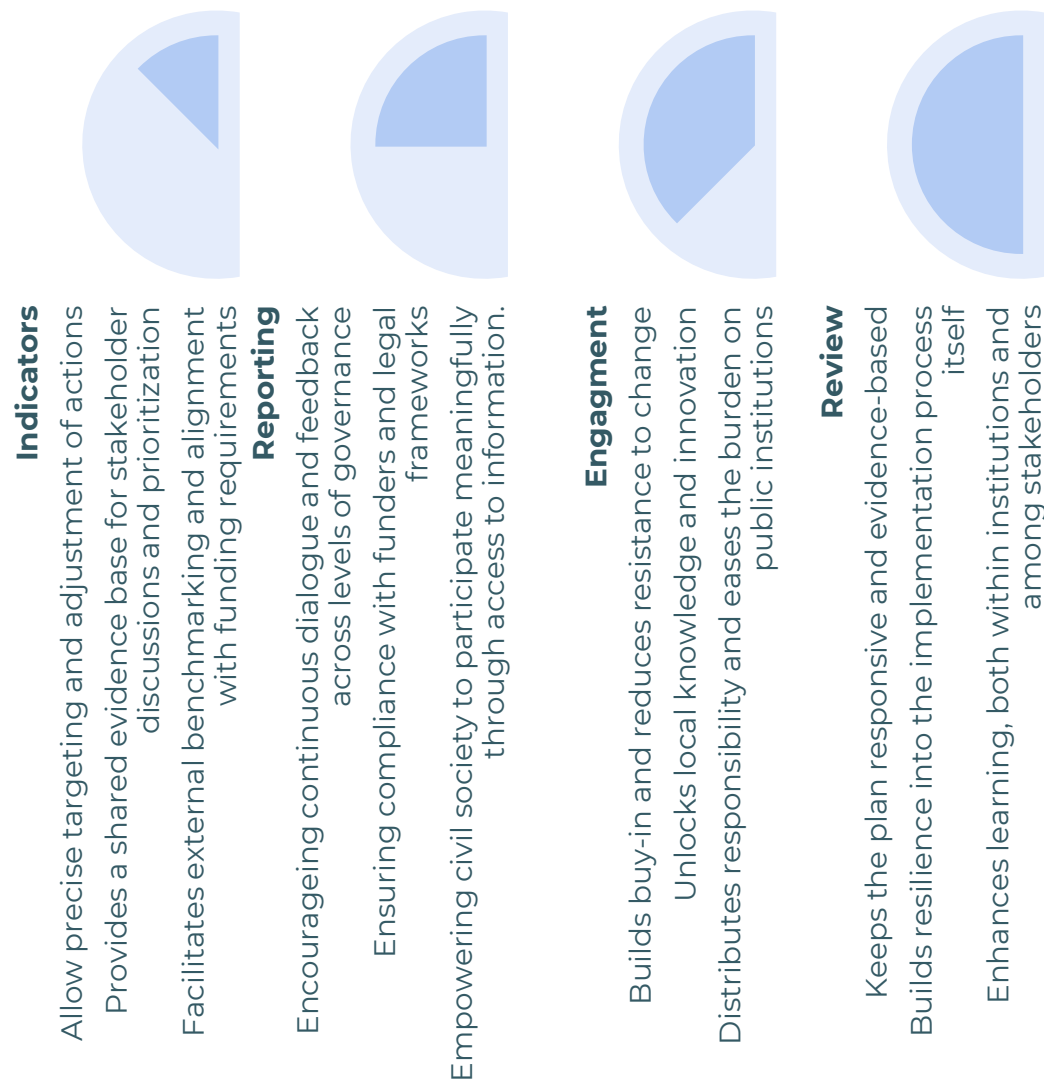


Figure 4 . Review of enabling conditions and implementation benefits



6.1. Indicators

Indicators serve as the critical foundation for performance measurement, learning, and evidence-based decision-making. Without clear, measurable indicators, it is impossible to assess whether actions are effective, if resources are being used efficiently, or whether course corrections are needed. Indicators also help maintain alignment with national, EU, and international climate targets, making Zadar County's efforts part of a broader policy framework.

How indicators enable implementation of actions;

- Allow precise targeting and adjustment of actions.
- Provides a shared evidence base for stakeholder discussions and prioritization.
- Facilitates external benchmarking and alignment with funding requirements (e.g., EU Green Deal, Horizon Europe).

To ensure transparent and effective monitoring of decarbonization and climate adaptation efforts, Zadar County should adopt a structured, data-driven system based on quantitative and qualitative indicators, additionak to those predisted by Tourism Law (NN 156/23), aligned with IPCC guidelines, EU frameworks, and the UN Tourism Glasgow Declaration. Key indicators include:

AREA	SAMPLE INDICATORS
Tourism Emissions	Annual CO ₂ eq emissions from tourism sector (energy, transport, waste, etc.); % reduction from baseline
Energy Efficiency	Number of buildings with energy audits; % improvement in energy performance
Nature-Based Solutions	Area (m ²) of implemented green infrastructure; number of NBS projects completed
Transport Sustainability	Number of EV charging stations; share of low-emission transport modes used by tourists
Stakeholder Engagement	Number of stakeholders involved in planning processes; training sessions conducted

**Climate
Resilience**

% of tourism infrastructure upgraded to climate-resilient standards; drought/flood readiness scores

Data should be collected annually, starting in 2026, and compared against baseline values established during the initial situation analysis and energy balance assessment.

6.2. Reporting

Robust reporting mechanisms are crucial for transparent governance. They allow stakeholders—including citizens, businesses, institutions, and international partners—to understand what is being done, what barriers are emerging, and how resources are allocated. Transparency reduces resistance, builds trust, and enhances the credibility of public institutions.

How is reporting enabling implementation:

- Encourage continuous dialogue and feedback across levels of governance.
- Ensuring compliance with funders and legal frameworks.
- Empowering civil society to participate meaningfully through access to information.

To ensure accountability and continuous stakeholder trust, Zadar County should focus on these actions which can enhance transparency and feedback mechanisms:

- **Publish annual progress reports** detailing achievements, challenges, and gaps for both mitigation and adaptation goals.
- Develop an **online public dashboard** to visualize key metrics (e.g., emissions reductions, NBS installations, funding spent).
- Report progress through **existing EU and national monitoring systems**, including environmental and climate reporting tools (e.g., Covenant of Mayors, LIFE project platforms).
- Organize **biannual stakeholder briefings and public consultations** to share insights, challenges, and opportunities.



- Include a **barrier log**, which records implementation difficulties and identifies needed policy, funding, or technical adjustments.

6.3. Engagement

No climate strategy can succeed without the involvement of those affected by and contributing to emissions and vulnerability. Stakeholder engagement ensures that actions are socially acceptable and technically feasible. It increases legitimacy and encourages co-responsibility in implementation.

The County should apply a **multi-stakeholder governance approach**, engaging:

- Local self-governments in tailoring measures to local contexts
- Tourism businesses and hospitality providers in co-developing low-carbon services and applying eco-labels
- Academia and civil society in knowledge generation, monitoring, and public outreach
- Vulnerable communities and youth, ensuring inclusive climate justice and long-term behavioral change.

Meaningful engagement is a central enabler of success. The implementation strategy involves:

- Establishing a **Zadar County Climate Coordination Council** comprising public institutions, tourism operators, civil society, researchers, and community representatives.
- Conducting **sector-specific workshops** (tourism, transport, agriculture, construction) to co-develop actions and foster ownership.
- Launching a **public education campaign** on low-carbon tourism and climate resilience through media, schools, and visitor centers.
- Creating **incentives and recognition programs** (e.g., green tourism awards, subsidies for eco-certification) to motivate private sector participation.
- Ensuring the **voices of vulnerable communities and youth** are included in decision-making, particularly regarding adaptation measures.



6.4. Review

Climate change is dynamic, and so must be the strategies that respond to it. A review mechanism ensures that implementation is not static but evolves with new data, technologies, and contextual developments. Reviews also help correct inefficiencies, scale successful initiatives, and phase out ineffective ones.

How is review enabling implementation:

- Keeps the plan responsive and evidence-based
- Builds resilience into the implementation process itself
- Enhances learning, both within institutions and among stakeholders

The Action Plan will follow an **adaptive management** approach with the following review mechanisms:

- A **formal review every four years**, led by Zadar County in cooperation with expert advisors, to evaluate goal alignment, indicator trends, and funding performance.
- Incorporation of **feedback loops** to adjust targets, reallocate resources, or revise measures based on emerging climate data, stakeholder feedback, or technological developments.
- Development of **scenario-based planning tools** to integrate uncertainty and assess the effectiveness of different decarbonization and adaptation pathways.
- Annual engagement of **external auditors or evaluators** (e.g., university partners or environmental NGOs) for an independent assessment of progress and institutional performance.

Together, these enabling conditions provide a systemic foundation for the success of Zadar County's climate strategy. By embedding robust indicators, transparent reporting, inclusive engagement, and adaptive review into the heart of implementation, Zadar County ensures that its climate action is not only visionary but also practical, scalable, and resilient over time. This holistic governance approach aligns with best practices in international climate policy and positions Zadar as a leading sustainable destination in the Mediterranean.

7. CONCLUSIONS

7.1. Conclusions for Advancing Climate Action in Zadar County

Mitigation and adaptation measures in Zadar County are being implemented continuously. To enhance measures specifically aimed at increasing tourism resilience in relation to the necessity of carbon neutrality and climate change, it is recommended to:

- I. Carefully plan tourism infrastructure and tourism offerings based on energy balance and analysis of vulnerability and risk.
- II. Incorporate the most advanced energy efficiency and renewable energy measures, as well as climate change considerations into design solutions (new data for planning!).
- III. Prioritize solutions with multiple benefits – nature-based solutions and flexible adaptation measures.
- IV. Consider opportunities and long-term sustainability (environmental and financial).
- V. Involve experts from relevant fields in the development of optimal solutions (meteorology, climatology, hydrology, architecture, construction, environmental protection, economics, law, etc.).
- VI. Ensure the longevity and resilience of nature and ecosystem services.

Zadar County currently lacks a developed energy balance, although energy-saving measures are being implemented. Under the current climate scenario, three thematic areas (TP) – Tourism Infrastructure, Tourism Offerings, and Natural Areas – are generally at low levels of climate risk, except for hazards such as wildfires and floods. However, under a future climate scenario (up to 2100), the number and severity of hazards and risks significantly increase. According to the risk assessment scale (Table 3), moderate levels of risk have been identified for heatwaves, droughts, wildfires, floods, sea flooding, and strong winds and storm surges, making accelerated climate adaptation necessary.

The identified level of climate risk for these hazards requires a series of adaptive measures, key ones listed in Tables 5 and 6, with an emphasis on nature-based solutions (NBS). Long-term preservation of nature and ecosystem services is a fundamental basis for climate mitigation and adaptation, and for tourism resilience – a key economic sector of the destination.

This document provides a substantive, methodological, and data foundation for new strategic-planning, programming, and reporting documents of Zadar County in the fields of tourism, urban planning, transport, energy, climate change, and environmental and nature protection.

Depending on how climate risk concepts are integrated into Zadar County's policies and practices, the next possible step is the implementation of an analysis of supporting factors and obstacles for climate action implementation.



Ideally, conducting a brief study and/or structured interviews with governance structures, businesses, and local residents is recommended as a starting point. The study or interviews should be based on a reliable and sufficiently large sample to avoid generalizations.

7.2. Conclusions Related to the Implementation of the Interreg NaTour4CC Project

Although this document focuses on proposing nature-based measures (NBS), it also justifiably suggests other measures (structural and non-structural), primarily to consider their potentially greater synergistic effects compared to implementing only one type of measure.

It was especially important to ensure a common understanding of thematic challenges, achieved through close cooperation among governance structures (Zadar County), implementing stakeholders (JU Natura Jaderna, Zadar County Tourist Board), the scientific community (University of Zadar), and the Institute for Tourism (Zagreb).

Given that the identified climate risks similarly affect Mediterranean destinations and their tourism activities and resources (nature, infrastructure, local population), we believe that the CRAs, with the application of a broader set of climate resilience measures, can be applied to most Mediterranean destinations.

Ultimately, this document is intended to facilitate the implementation and realization of project outcomes in the NaTour4CChange pilot area – Dugi Otok, Saharun Beach.

APPENDIX

